ENERGY EFFICIENT HIGH TECH BUILDINGS

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PG&E Cleanroom Benchmarking

Goals of project:

- **Obtain energy use breakdown for High-tech industries**
- **Define metrics of interest**
- **Establish and begin to populate database**
- **Provide measurement data and observations to participants**

PG&E Cleanroom Benchmarking

Additional goals:

- **Provide benchmark data to all building owners/operators**
- **Identify best practices**

PG&E Cleanroom Benchmarking

- Includes various cleanliness classes
- Large and small PG&E customers included
- Focus on cleanroom environmental systems
- Data reported anonymously, but publicly
- Metrics defined

PG&E Cleanroom Benchmarking

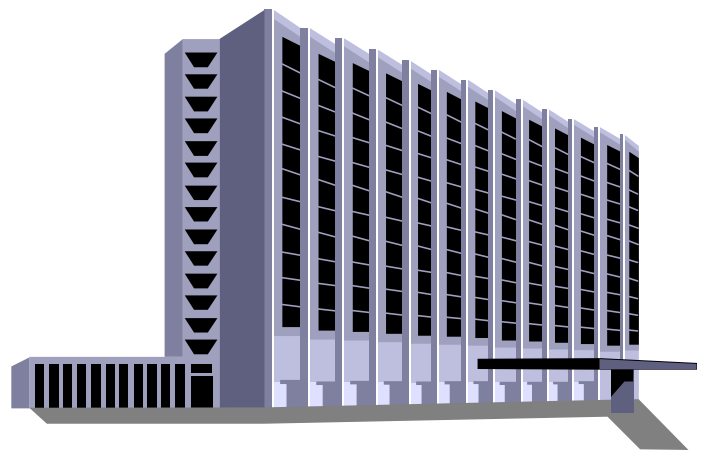
Longer term goals:

- **Provide methodologies for self evaluation**
- **Prepare design guide**

Efficiency Opportunities

Strategies

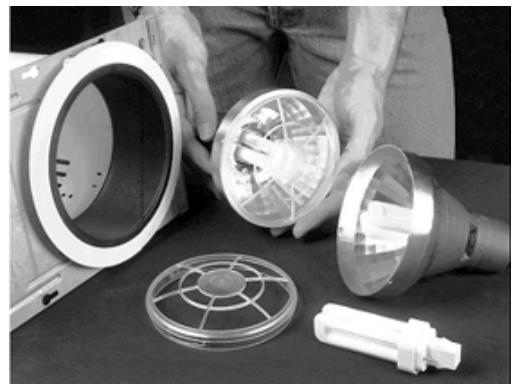
- **Load reduction/diversity**
- **Sizing / interdependency**
- **Redundancy**
- **Incremental build-out**
- **Controls**
- **Commissioning**

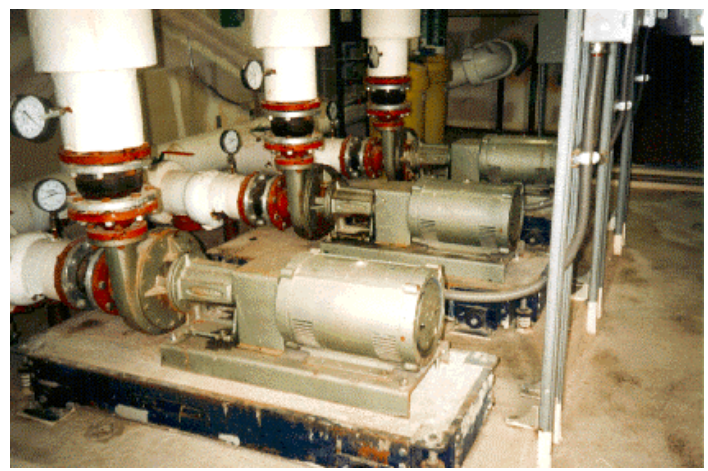


Efficiency Opportunities

Systems efficiency

- **Make-up air**
- **Recirculation air**
- **Exhaust**
- **Chilled water**
- **Process utilities**
- **Lighting**

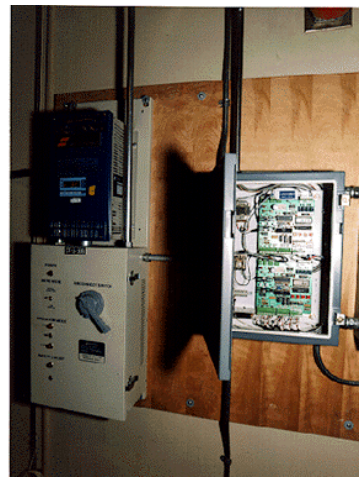




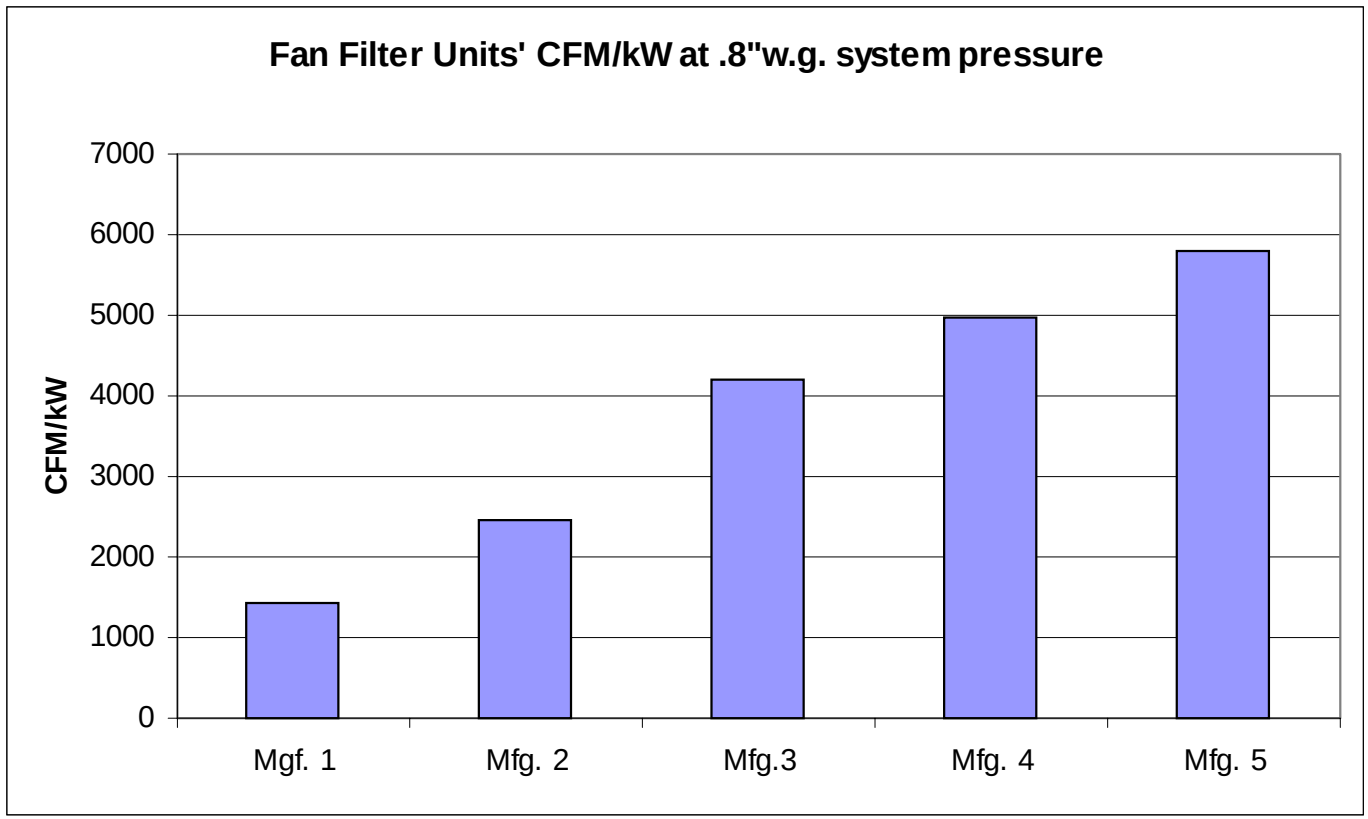
Efficiency Opportunities

Component efficiency

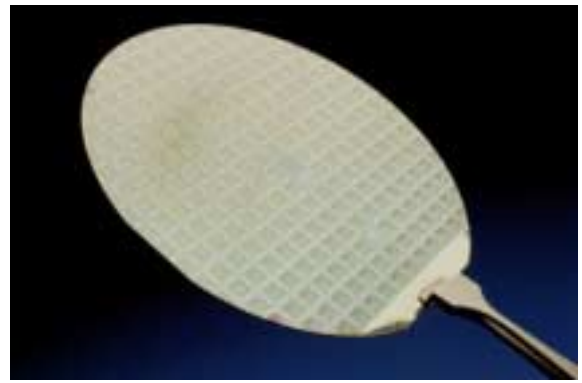
- **Fans**
- **Filters**
- **Pumps**
- **Wet benches**
- **Gas cabinets**
- **Lighting**
- **Architectural**



FFU Energy Efficiency



Cleanroom Airflow



Cleanroom air velocity

IEST recommended air flow

Experimental air reduction results

Research in molecular contamination/airflow

CFD modeling

Cleanroom Energy Efficiency Ideas

- Make energy efficiency a selection criteria
- Perform life cycle cost evaluation
- Obtain actual power consumption of process equipment
- Include air velocity control strategies

Cleanroom Energy Efficiency Ideas

- **Provide incentive for A/E to incorporate energy efficient design**
- **Revise company standards to address energy efficiency**
- **Research equipment efficiency**
- **Include speed control on fans and pumps**

A-Team Activities
Philosophy
The Team
Career Opportunities
Contact the Ateam

Methods of conserving energy through new designs for implementation in high tech industries are detailed in this guide. Energy efficient devices featured such as fume hoods and cleanrooms offer operational efficiency in laboratories.

A Design Guide for Energy-Efficiency Research Laboratories

Other helpful links:
Labs for the 21st Century
Cleanrooms by LBNL
Fume Hood - Student Web Sites
High Tech Building Research and Development

EPA United States Environmental Protection Agency

LABS FOR THE 21ST CENTURY

CONFERENCE 2000

September 6 - 8, 2000

San Francisco, California

Learn how to incorporate energy efficient measures into laboratory design and operation. Discover how multiple public and private sector laboratories are reaping the benefits of renewable energy and sustainable design. Join peers and colleagues to share success stories and lessons learned. All of this and more will be part of the upcoming Laboratories for the 21st Century conference in San Francisco, California.

http://www.epa.gov/labs21century/conf/conf2000/index.html

Cleanrooms Website

http://eetd.lbl.gov/cleanrooms/